DATA TRANSMISSION SCHEME FOR SCANNER

BACKGROUND OF THE INVENTION

5   Field of Invention

The present invention relates to a data transmission scheme for a scanner. More particularly, the present invention relates to a data transmission scheme for a scanner that uses the scanner's internal synchronous dynamic memory to transmit accurate scan data.

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Description of Related Art

In the past, when a synchronous dynamic memory is accessing data in the burst mode, the quantity of data being access must be in a unit that can be processed in a burst mode transmission. Hence, unwanted scan data or padded data are sometimes written 15   into or read from a synchronous dynamic memory.

Assume each burst mode transmission by the synchronous dynamic memory accesses four data units altogether. If one or two units of data remain near the end of a data transmission session, some data units adjacent to the last one or two data units need to be transmitted alongside the required data. Because only the first one or two data 20   units are actually required, some padded or unwanted data units are transmitted leading to a lowering of transmission efficiency for the scanner.

SUMMARY OF THE INVENTION

Accordingly, one object of the present invention is to provide a data transmission scheme for a scanner such that only the required scan data are access. The data transmission scheme for correct transmission of scan data uses a synchronous

5 dynamic memory and a buffer.

The synchronous dynamic memory serves as a storage area for scan data and has a masking function for treating the last batch of data. The masking function can be applied to blank out unwanted scan data when the last remaining scan data is written from the synchronous dynamic memory to the buffer. Thus, the last batch of data

10 written to the buffer is correct data. The buffer is connected to the synchronous dynamic memory for receiving the scan data and temporarily holding the scan data for subsequent transmission.

This invention also provides a method of transmitting correct scan data within a scanner. The invention relates to the utilization of a synchronous dynamic memory to

15 process scan data correctly and quickly.

The correct transmission of scan data according to this invention includes the following steps. First, the quantity of data to be written into the synchronous dynamic memory is compared with the quantity of data capable of being processed in a burst mode transmission. If the quantity of scan data is greater than or equal to a burst mode

20 transmission, a write command is executed so that the scan data is written into the synchronous dynamic memory. On the other hand, if the quantity of data to be written into the synchronous dynamic memory is smaller than a burst mode transmission, the scan data is checked to see if it is the last remaining scan data. If the scan data is the

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last remaining scan data, the write command is executed so that the last remaining scan data is written into the synchronous dynamic memory.

This invention also provides an alternative method of transmitting correct scan data within a scanner. The invention relates to the utilization of a synchronous dynamic memory to process scan data correctly and quickly.

The correct transmission of scan data according to the alternative method of this invention includes the following steps. First, the quantity of data stored inside the synchronous dynamic memory is compared with the quantity of data capable of being processed in a burst mode transmission. If the quantity of scan data inside the synchronous dynamic memory is greater or equal to a burst mode transmission, a read command is executed. Ultimately, the scan data in the synchronous dynamic memory are read out and written into a buffer. On the other hand, if the quantity of scan data in the synchronous dynamic memory is smaller than a burst mode transmission, the scan data is checked to see if it is the last remaining scan data. If the scan data is the last remaining scan data, the read command is executed so that the last remaining scan data is written into the buffer.

It is to be understood that both the foregoing general description and the following detailed description are exemplary, and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The

drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.   In the drawings,

Fig. 1 is a block diagram showing an equipment configuration for treating scan data inside a scanner according to a first preferred embodiment of this invention;

5   Fig. 2 is a block diagram showing an equipment configuration for treating scan data inside a scanner according to a second preferred embodiment of this invention;

Fig. 3 is a flow chart showing the progression of steps for writing batches of scan data into the synchronous dynamic memory using some internal components according to a first preferred embodiment of this invention;

10   Fig. 4 is a flow chart showing the progression of steps for reading batches of scan data from the synchronous dynamic memory using some internal components according to a second preferred embodiment of this invention; and

Fig. 5 is a diagram serving to illustrate the operation of the masking function inside a synchronous dynamic memory according to this invention.

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DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the 20   description to refer to the same or like parts.

Fig. 1 is a block diagram showing an equipment configuration for treating scan data inside a scanner according to a first preferred embodiment of this invention.   The equipment configuration for correctly transmitting scan data mainly includes a

synchronous dynamic memory 106, a buffer unit 112, a video processor 100, a second

buffer unit 102, a buffer controller 104, a counter 108 and a comparator 110.

The synchronous dynamic memory 106 is a location for holding scan data.

The synchronous dynamic memory 106 also has a masking function for processing the

5   last batch of scan data.   The last batch of scan data is the amount of data left near the

end of transmission such that the total amount is smaller than the transmission capacity

of a burst mode transmission.   The buffer unit 112 is directly connected to the

synchronous dynamic memory 106 for receiving and temporarily holding the scan data

sent from the synchronous dynamic memory 106.

10   The video processor 100 is a device for generating scan data.   The buffer unit

102 is connected to the video processor 100 to serve as temporary storage for the scan

data.   The buffer controller 104 is connected to the buffer unit 102 for processing the

scan data within the buffer unit 102.   The video processor 100 will put a tag on the last

batch of scan data in a data transmission session.   Utilizing the tag attached to the last

15   batch of data, the synchronous dynamic memory 106 is able to terminate the reading

operation when the last batch is read.   If the last batch of scan data is smaller than the

amount of data the synchronous dynamic memory 106 can handle at a time, the

synchronous dynamic memory performs a masking operation on the received data.

The counter 108 is coupled between the synchronous dynamic memory 106 and

20   the buffer unit 112 for registering the amount of scan data written by the synchronous

dynamic memory 106 into the buffer unit 112.   The comparator 110 is connected to the

counter 108 for comparing the currently transmitted data with the amount of scan data

to be transmitted as registered by the counter 108.

When the amount of scan data reaches the pre-determined transmission quantity, the buffer controller 104 will trigger the buffer unit 102 to execute a read command. In here, the pre-determined transmission quantity refers to the amount of data that can be read or written in a burst mode transmission. In addition, the last batch of scan data

5   refers to an amount of data smaller than the total amount of data a burst mode transmission is able to handle.

Fig. 2 is a block diagram showing an equipment configuration for treating scan data inside a scanner according to a second preferred embodiment of this invention. The equipment configuration for correctly transmitting scan data mainly includes a

10   synchronous dynamic memory 106, a buffer unit 112, a video processor 100, a second buffer unit 102, a counter 203, a second counter 205, a comparator 204, a third counter 108 and a second comparator 110.

The synchronous dynamic memory 106 is a location for holding scan data. The synchronous dynamic memory 106 also has a masking function for processing the

15   last batch of scan data. The buffer unit 112 is connected to the synchronous dynamic memory 106 for receiving and temporarily holding the scan data sent from the synchronous dynamic memory 106.

The video processor 100 is a device for generating scan data. The buffer unit 102 is connected to the video processor 100 to serve as temporary storage for the scan

20   data. The counter 203 is coupled between the video processor 100 and the buffer unit 102 to count the quantity of scan data transmitted from the video processor 100 to the buffer unit 102. The counter 105 is coupled between the buffer unit 102 and the synchronous dynamic memory 106 to count the quantity of scan data transmitted from the buffer unit 102 to the synchronous dynamic memory 106. The comparator 204 is

coupled between the counter 203 and the counter 205 to compare the values between the counter 203 and the counter 205. Ultimately, the comparator 204 is able to obtain the difference in scan data transmission between the two counters.

The counter 108 is coupled between the synchronous dynamic memory 106 and

5   the buffer unit 112 to count the quantity of data transmitted from the synchronous dynamic memory 106 to the buffer unit 112. The comparator 110 is connected to the counter 108 for comparing the currently transmitted data with the amount of scan data to be transmitted as registered by the counter 108.

Fig. 3 is a flow chart showing the progression of steps for writing batches of

10   scan data into the synchronous dynamic memory using some internal components according to a first preferred embodiment of this invention. In step S300, the quantity of data to be written into the synchronous dynamic memory is compared with the quantity of data capable of being processed in a burst mode transmission. If the quantity of scan data is greater than or equal to a burst mode transmission, a write

15   command (step S302) is executed so that the scan data is written into the synchronous dynamic memory. When the execution of the write command is complete, control is returned to step S300. The aforementioned process is repeated until the amount of scan data is less than a transmission quantity. If the quantity of data to be written into the synchronous dynamic memory is smaller than the transmission quantity, the scan

20   data (in step 304) is checked to see if it is the last remaining scan data. If the scan data is the last remaining scan data, the write command (in step S305) is executed so that the last remaining scan data is written into the synchronous dynamic memory. On the other hand, if the scan data is not the last remaining scan data, control is returned to step S300 so that the previous cycle is repeated until the last batch of data remains.

Whether the batch of written data is the last remaining scan data or not can be determined by looking for the presence of tags.

Fig. 4 is a flow chart showing the progression of steps for reading batches of scan data from the synchronous dynamic memory using some internal components according to a second preferred embodiment of this invention. In step S360, the quantity of scan data to be read from the synchronous dynamic memory is compared with the quantity of data capable of being processed in a burst mode transmission. If the quantity of scan data is greater than or equal to a burst mode transmission, a read command (step S308) is executed so that the scan data in the synchronous dynamic memory are read out. In step 310, the scan data is written into the buffer unit. If the quantity of scan data read from the synchronous dynamic memory is still larger than a burst mode transmission, control is returned to step S306. The aforementioned process is repeated until the amount of scan data in the synchronous dynamic memory is less than a transmission quantity. If the quantity of data to be read from the synchronous dynamic memory is smaller than the transmission quantity, the scan data (in step 311) is checked to see if it is the last remaining scan data. If the scan data is the last remaining scan data, the read command (in step S312) is executed so that the last remaining scan data is read and then transferred to into the buffer unit (in step S314). On the other hand, if the scan data is not the last remaining scan data, control is returned to step S306 so that the previous cycle is repeated until the last batch of data remains. To prevent the transmission of unwanted data due to insufficient data in a burst mode transmission, the masking function in the synchronous dynamic memory is use to blank out the accompanied unwanted data.

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Fig. 5 is a diagram serving to illustrate the operation of the masking function inside a synchronous dynamic memory according to this invention. The synchronous dynamic memory 106 needs to transmit the last remaining scan data 402, in other words, the scan data 1, 2, 3, and 4 as shown in Fig. 5. If a tag 400 is found in the last two

5   batches of the scan data 402, the two batches of data with the tag on is regarded as the last transmission data. Since the first two batches are the last transmission data, the third and the fourth batch of scan data is redundant and should be discarded. Utilizing the masking function of the synchronous dynamic memory, the last two batches of scan data are blanked out leaving the correct data in the last transmission.

10   In summary, the advantage of this invention is the correct transmission of scan data even if a fraction of the transmitted data in a burst mode transmission is useful.

It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the

15   present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.